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SEPTEMBER 1994

NORTHWESTERN HAWAIIAN ISLANDS BOTTOMFISH FISHERY, 1993

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ADMINISTRATIVE REPORT H-94-07

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Southwest Fisheries Science Center
Administrative Report H-94-07

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OVERVIEW OF THE FISHERY

The Federal fishery management plan's 1989 amendment for limited entry into the Northwestern Hawaiian Islands (NWHI)(Fig. 1) bottomfish fishery has stabilized bottomfishing effort within the designated limited access *Ho'omalu* zone. Under the amendment, any vessel owner meeting certain eligibility criteria for a limited entry permit was given 5 years (through December 31, 1993) to apply for a permit as a "grandfather." After the initial grandfather period, entry into the limited access fishery by qualified applicants may be allowed when certain biological and economic criteria are met. As of the application cut-off date, the National Marine Fisheries Service (NMFS) had received a total of eight applications for initial grandfather permits. It is estimated that about four of the applicants will qualify for permits and join the five vessel owners who held *Ho'omalu* Zone permits in 1993.

The number of vessels fishing the *Ho'omalu* zone (the limited access area) decreased by one vessel in 1993. The amount of effort, in terms of days fished, also decreased. Data indicate that the total NWHI and the *Ho'omalu* zone catch was below 1992 levels (Table 1).

The catch for the *Mau* zone (open access area) increased in 1993. The number of active vessels remained unchanged while fishing effort (number of trips) increased (Table 2).

The catch of opakapaka[1] (pink snapper) from both areas continues to remain close to last year's level. Catch volume dropped slightly in the *Mau* zone while the *Ho'omalu* zone catch increased slightly, producing a net positive gain in landed volume. The volume of uku (grey snapper) landings continues to decline in both zones.

Predation on hooked fish by sharks and dolphins (*Tursiops* sp.) continues to plague fishing operations. Post-trip interviews with vessel captains indicate that sharks were responsible for the vast majority of the losses. Monk seals, *Monachus schauinslandi*, were implicated much less frequently. Kobayashi and Kawamoto[2] have preliminarily estimated the current losses based on damaged fish that were boated at $217 per trip.

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[1] Scientific names are listed in Table 3.

[2] Kobayashi, D. R. and K. E. Kawamoto. In review. Evaluation of shark, dolphin, and monk seal interactions with Northwestern Hawaiian Island bottomfishing activity: A comparison of two time periods and an estimate of economic impacts. *Fish. Res.*

Preliminary estimates of potential lost revenue from stolen or damaged fish, coupled with the associated gear loss, may amount to as much as $7,000 per trip during periods of high levels of catch predation. Levels of catch predation appear to be variable, with trips to heavily fished areas usually having an abundance while trips to other less fished areas possibly having none.

Toward the end of 1993 many of the *Ho'omalu* zone vessels were fishing farther up the Hawaiian Archipelago in an attempt to locate more productive fishing areas. The expanding areas of fishing of the NWHI *Ho'omalu* zone fleet may have an effect on the interaction rate as interactions seem to occur mainly in areas that are heavily fished.

The observer program was transferred from the Pacific Islands Protected Species Program, Southwest Region, National Marine Fisheries Service (NMFS) to the Fisheries Observer Branch of the Southwest Region in Long Beach, California in 1993. Observer coverage has documented interactions, although there have been no official interaction reports filed by fishermen.

FLEET OPERATIONS IN THE NWHI

General Fleet Operations

There were 35 permits (35 permits in 1992) issued in 1993 of which 12 vessels fished (Fig. 2). There were 5 *Ho'omalu* zone permits issued of which 4 vessels fished (5 permits--5 active vessels in 1992). Thirty permits were issued for the *Mau* zone of which 8 vessels were active (30 permits--8 active vessels in 1992).

The NWHI fleet landings are jointly monitored in Honolulu by personnel of the Fishery Management and Economics Program (FMEP) of the NMFS Honolulu Laboratory and the State of Hawaii Division of Aquatic Resources (HDAR). There are two sets of 1993 NWHI vessel activity and catch per trip information listed in Table 4. The first 1993 column (1993[a]) is based on a consistent NMFS sample of the fleet which more accurately reflects the status of the Oahu-based fleet. The second set of 1993 data (1993[b]) is based on a combination of NMFS and HDAR data. This reflects a more complete data base which includes landings from Kauai-based vessels that could not be directly monitored by the NMFS as well as additional data for the Oahu-based vessels.

There were 106 trips made by 12 individual vessels throughout the NWHI (Table 4, Fig. 2). This represents an increase in the number of trips although the number of participants fell by one vessel. The fleet averaged 8 trips per vessel while the number of trips for an individual vessel ranged from 3 to 15. The areas fished ranged from Nihoa island to Lisianski island. The average trip length, based on NMFS

monitoring, was 13 days with 7 days of fishing (n = 90 trips) compared with 13.8 days with 8.5 days of fishing (n = 70 trips) in 1992.

Comparisons of trip operations and landings by management areas for 1990-93 are shown in Table 5. These results were based only on NMFS-monitored data for consistency (data prior to 1991 are entirely NMFS figures). Table 6 compares the 1993 NMFS and the combined NMFS-HDAR data sets.

Of the 12 active vessels, 7 fished on a regular basis (13 active vessels--6 on a regular basis in 1992)--4 vessels in the *Mau* zone and 3 vessels in the *Ho'omalu* zone. One *Mau* and 1 *Ho'omalu* zone vessel concurrently held longline limited entry permits while 1 *Ho'omalu* vessel held a NWHI lobster permit.

Hurricane Iniki which hit Hawaii in September 1992 continued to affect the participation of the Kauai-based vessels. Only 1 vessel home-ported on Kauai continued to fish the NWHI during 1993. Three vessels fished out of Kauai in years past.

Ho'omalu Zone Fleet Operations

Four permitted vessels fished the *Ho'omalu* zone, but only three of them fished regularly. There were 34 trips made with an average of 8 trips per vessel (Table 6, based on NMFS-HDAR data). Trips made per vessel ranged from 3 to 11, and areas fished ranged from French Frigate Shoals to Lisianski island. The majority of the fishing activities were centered in the Brooks Banks to Northampton seamounts area.

The average trip lasted 20.7 days with 11.4 days of fishing (n = 30, NMFS monitored trips). The average trip length has increased as days fished (Table 5) remained essentially unchanged. The increased trip length was the result of longer distance traveled, which reflected an effort to locate productive areas. An increased catch per fishing day while maintaining the same number of fishing days per trip is the result. Revenue per trip and per vessel has also increased. Effort, in terms of total days fished by the fleet, has decreased 12% (NMFS monitored data).

Mau Zone Fleet Operations

The number of vessels fishing in the *Mau* zone remained stable. Eight vessels made 72 trips this year (NMFS-HDAR data). Only one of the vessels on Kauai fished the 1993 season. The addition of three Oahu-based vessels made up for the decreased Kauai-based vessel fishing activity.

Fishing effort (total days fished by the fleet) increased 12% within the *Mau* zone (Table 5). Fishing trips to the *Mau* zone averaged 9.3 days in length with 4.9 days of fishing (n = 60,

NMFS monitored trips). The fishing area encompassed the entire *Mau* zone.

BOTTOMFISH LANDINGS DATA

General NWHI Landings

Total bottomfish landings for the NWHI decreased 9% (Table 7, Fig. 3). The average NWHI landings for all species per trip (NMFS-HDAR data, Table 4) were 3,804 pounds, 1,210 pounds less than in 1992. BMUS accounted for 94% of the total landings (1992 = 91%). BMUS landings per trip averaged 3,597 pounds. BMUS catch per trip in the *Mau* zone rose a scant 3%, while *Ho'omalu* zone catches decreased 11% (NMFS-HDAR data).

Species composition for the NWHI is provided in Table 8 and by zones in Table 9. The top five BMUS accounted for 87% of the BMUS landings (Fig. 4). Opakapaka landings were the highest, followed by butaguchi and hapuupuu. Onaga, uku, other BMUS, and ehu made up the remainder of the landings, respectively.

The catches of uku were down 61% overall this year. While *Mau* zone uku landings rose by 46%, landings are nowhere near the peak of 1990. *Ho'omalu* zone uku landings decreased 69% from its record-setting 1992 season.

Opakapaka landings increased 8% in 1993. The *Mau* zone catch per trip decreased 14%, while *Ho'omalu* zone landings increased 19% per trip.

Ho'omalu Zone Landings

Ho'omalu zone bottomfish landings were down 18%. BMUS landings were 87% by weight of the total bottomfish landings. Opakapaka landings were the highest (Fig. 5B) followed by hapuupuu, onaga, butaguchi, other BMUS, and ehu. The *Ho'omalu* zone average landings per trip were 8,584 pounds with 8,414 pounds (98%) of BMUS (Table 6, NMFS-HDAR data). The average landings per trip decreased 13% as average BMUS landings per trip also decreased by 11%. The majority of the decreases in catch can be attributed to uku, hapuupuu, butaguchi, and white ulua.

Landings volume of butaguchi and white ulua does not necessarily reflect actual catch volume. Data from the observer program indicate that as many as half or more of the butaguchi caught in the *Ho'omalu* zone are released. A similar percentage of white ulua are also released. Butaguchi releases are mainly because of their relatively short shelf life. Most of the large white ulua are released because smaller fish get a higher price and are easier to store. The butaguchi releases do not appear to be size dependent. Both of these species are of relatively low value. Neither are targeted from the outset of the trip; rather

they are used as fillers or to "make weight" later in the trip to offset any shortfalls in the volume of the target species. Most fishermen have been releasing these fish alive when they are caught early in the trip. Kahala, having no value in the market and perceived to be in competition with the opakapaka for resources, are usually killed before disposal.

The large number of releases may affect fishing mortality assumptions for these species. This information along with the additional unknown mortality caused by catch predation may combine to show an adverse effect on the health of the stocks.

MAU ZONE LANDINGS

The *Mau* zone bottomfish landings increased 36%. Landings per trip averaged 1,547 pounds with 1,323 pounds (85%) of BMUS. The BMUS catch per trip increased 3% while the overall catch per trip decreased by 8%. The landings were led by butaguchi (Fig. 2) followed by opakapaka, hapuupuu, uku, ehu, other BMUS, and onaga.

The observer data show that very few salable fishes are released. The fishing trips are of shorter duration, and shelf life of the fish is not compromised. The fishermen tend to retain virtually all of the catch on any given trip.

BOTTOMFISH PRICES

The 1993 overall market prices for bottomfish (all sources) in Hawaii increased slightly from 1992 levels (Table 10, Fig. 6A) as total bottomfish revenue decreased to $2.3 million (Table 11). The average price for NWHI and MHI bottomfish as a group has slightly increased (Table 10, Fig. 6B, 6C). The overall revenue has sustained a decrease in 1993 while import revenues increased (Table 7, Fig. 7).

The NWHI price structure for the targeted high value species appears to have been negatively impacted by the volume of imported fishes. Bottomfish imports to Hawaii dipped below 1992 levels, but the revenues are higher than they have been in 6 years (Fig. 8). The value of the imported bottomfish has risen steadily over the past few years. This increase is due to the improving quality of the fish and the species selection. Higher value fish--mainly onaga, ehu, and opakapaka--are being targeted for import from other areas of the Pacific.

The MHI fish continue to be at the high end of the price structure. Although these premium quality fishes have increased in price over 1992 levels, the importers have targeted the high market value species. The large fluctuations in the high-end price has been virtually eliminated except in special

circumstances; i.e., high seasonal demand or little or no local supply.

RECOMMENDATIONS

In 1993, mandated fishery data were collected primarily using the State of Hawaii's HDAR Bottomfish Trip Report form C-3A (Fig. 9). The State trip report form consolidated the daily catch information into a summary of the landings and value by trip. It was deficient in daily catch, effort, and area information. In 1994, after consultation with the Regional Director, the State addressed the lack of daily information by instituting a two-form report per trip format. A new Bottomfish Trip Sales Report form (Fig. 10) is combined with the standard Fish Catch Report form C-3 (Fig. 11), in place of the Bottomfish Trip Report form C-3A. These two forms provide some of the detailed information needed but do not quantify the fishing effort (except by day) and do not specifically address the possibility of protected species interactions with fishing operations. The effectiveness of the new reporting system will be evaluated at the end of the year.

The potential benefits of a **mandatory Federal logbook program** are great. The proposed federal daily bottomfish catch log (Fig. 12), which incorporates a protected species interaction log, would provide additional data needed for improved fishing mortality and fishing effort estimates (hours fished) by fishing area. It would also include columns for numbers of fish damaged, lost or released. These data are not presently available from the State data.

Information from the NMFS Honolulu Laboratory post-trip interviews and the limited number of observer trips indicate that large numbers of fish are at times released or lost to predation. The potential impact of both catch predation and releases on stock assessment indicate the need for further investigation. Estimates of the quantity and value of these losses due to sharks or protected species need to be better quantified. The loss of potential income to the vessels varies but can be great. The missing information on the species, numbers, and sizes of fish released or lost--due to all factors, may **negatively** affect stock assessment.

The mandatory SW Region's NMFS observer program currently in place has provided documentation on protected species interactions. A proposed federal logbook with the protected species interaction section, as provided in the longline fishery logbook, may serve to remind fishermen of the reporting requirements and allow easy reporting of interactions. Based on reporting, research to improve the efficiency of the fishing operations while reducing the interactions may be indicated.

Literature on the movements of deepwater bottomfish species is **nonexistent**; therefore, any information gleaned from a tagging program would prove invaluable for fisheries management. Data on seasonal movement or migration will help to identify the "home range," if any, that these fish have. Do these supposedly bottom-oriented fishes travel from bank to bank? Is there only one "Hawaiian" stock per species or are there more? These questions need to be answered to protect the resource.

Fishermen in the NWHI bottomfish fishery have expressed support for a tag and release program. Many of them are willing to tag fish that are to be released and to record information on the species, estimated weight, and location. The cumulative number of fish released by fishermen over the course of the year far exceeds that of the catch of research scientists.

A trial tag and release program of bottomfish management unit species was initiated by the Fishery Management and Economics Program (FMEP) Honolulu laboratory observers and was continued by the SWR observers on a time-available basis. There has been a recapture of a butaguchi tagged during this program. Athough the time period between tagging and recapture was only a few months with movement of only about 6 miles this shows that the possibility of recapture is plausible. The limited number of bottomfish tagged by a NMFS research cruise has also yielded a recapture. A kahala tagged around Necker island was recaptured 2 years later at Laie point, Oahu.

It is extremely unfortunate that tagging efforts have since been **discontinued** as the observer program has again changed hands, and no NMFS NWHI adult bottomfish tagging is planned at this time. The observer bottomfish tagging program or an expanded research tagging program should be considered to increase the knowledge of our commercially valuable bottomfish stocks.

ACKNOWLEDGMENTS

Thank you to the staff of the United Fishing Agency for their continuing support of our monitoring efforts; Joanne Kushima (HDAR) and Russell Ito for their dedication and monitoring proficiency; Sam Pooley, Ray Sumida, Don Kobayashi, Alvin Katekaru, Robert Schroeder, and Eugene Nitta for their help and expertise; and to all of the fishermen whose patience I have stretched many times over.

Table 1.--Hawaii's bottomfish landings NWHI and MHI, 1985-93 (thousands of pounds).

Area	1985	1986	1987	1988	1989	1990	1991[1]	1992[1]	1993[1]
Mau	NA	NA	NA	NA	118	249	103	71	98
Ho'omalu	NA	NA	NA	NA	184	173	283	353	287
Total	922	869	1015	625	303	421	387	424	385
MHI[2]	763	810	783	1164	1006	645	561	587[3]	348[3]

[1]NWHI data from combination NMFS and HDAR.
[2]Data from HDAR.
[3]Preliminary data.

Table 2.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (*Mau* and *Ho'omalu* Zones) comparing the combination NMFS and HDAR data set for 1992-93.

	1992		1993	
	Mau	*Ho'omalu*	*Mau*	*Ho'omalu*
Vessels (No.)	8	5	8	4
Trips (No.)	55	37	72	34
Trips/vessel (No.)	6	7	9	8
BMUS/trip (lb)	1,275	9,468	1,323	8,414
Total catch/trip (lb)	1,690	9,954	1,547	8,584
Revenue/trip (US$)	4,754	28,977	4,736	25,553
Revenue/vessel (US$)	32,687	214,430	42,624	217,208

Table 3.--List of common and scientific names of frequently caught species (BMUS = bottomfish management unit species).

Common name	Scientific name
BMUS	
Onaga	*Etelis coruscans*
Opakapaka	*Pristipomoides filamentosus*
Ehu	*E. carbunculus*
Kalekale	*P. seiboldii*
Gindai	*P. zonatus*
Uku	*Aprion virescens*
Lehi	*Aphareus rutilans*
Yellowtail kalekale	*P. auricilla*
Hapuupuu	*Epinephelus quernus*
Butaguchi	*Pseudocaranx dentex*
White ulua	*Caranx ignobilis*
Black ulua	*C. lugubris*
Kahala	*Seriola dumerili*
Taape	*Lutjanus kasmira*
Other Bottomfish	
Papa ulua	*Carangoides orthogrammus*
Omilu	*Caranx melampygus*
Hogo	*Pontinus macrocephalus*
Miscellaneous bottomfish	

Table 4.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands, 1988-93 (BMUS = bottomfish management unit species). Data for 1988-93[a] are based on a consistent sample, by the NMFS, of the fleet in each year. Data from 1991[b]-1993[b] come from a combined NMFS-HDAR data set.

	1988	1989	1990	1991[a]	1992[a]	1993[a]	1991[b]	1992[b]	1993[b]
Vessels (No.)	13	10	16	14	10	12	17	13	12
Trips (No.)	93	50	80	73	78	88	131	92	106
Trips/vessel (No.)	7	5	5	5	7	7	7	7	8
Days at sea	1441	740	990	978	1079	1186	NA	NA	NA
Days fished	660	335	530	503	660	644	NA	NA	NA
Days/trip	15.5	15	12	13	13	13	NA	NA	NA
BMUS/trip (lb)	5502	5036	4053	3644	4160	3834	2878	4570	3597
Total catch/trip (lb)	6842	6054	4414	4104	4528	4005	3258	5014	3804
BMUS/fishing day (lb)	786	763	611	525	491	523	NA	NA	NA
Total catch/fishing (lb)	977	917	666	591	535	547	NA	NA	NA
Revenue/trip ($US)	16400	14994	11126	10045	12956	12103	8532	14496	11413
Revenue/vessel ($US)	117324	74971	55634	52381	101062	88756	65753	102588	100819

[a]Data from NMFS.
[b]Data from combination NMFS and HDAR data set.

Table 5.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (*Mau* and *Ho'omalu* Zones), 1990-93 (BMUS = bottomfish management unit species). Data are from NMFS-monitored trips only and may not match those in Table 2 due to rounding and extrapolation.

	1990		1991		1992		1993	
	Mau	*Ho'omalu*	*Mau*	*Ho'omalu*	*Mau*	*Ho'omalu*	*Mau*	*Ho'omalu*
Vessels (No.)	4	4	11	4	5	5	8	4
Trips (No.)	55	25	37	36	42	36	56	32
Trips/vessel (No.)	4	4	4	9	8	7	7	8
Days at sea	577.5	412.5	362.6	615.6	401	1079	520	662
Days fished	330	200	218	288	243	416	274	364
Day fished/trip	6	8	5.9	8	5.8	11.5	4.9	11.4
Days/trip	10.5	16.5	9.8	17.1	9.5	18.8	9.3	20.7
BMUS/trip (lb)	3438	5406	1976	5368	1388	7393	1312	8248
Total catch/trip (lb)	3820	5715	2151	6112	1786	7726	1484	8417
BMUS/fishing day (lb)	573	675	333	671	239	639	267	723
Total catch/fishing day (lb)	636	714	364	764	308	668	302	738
Revenue/trip ($US)	9650	14374	5732	14479	4941	22309	4667	25114
Revenue/vessel ($US)	37911	71874	19281	130311	41505	160626	32675	200918

Table 6.--Activity of the bottomfish fleet in the Northwestern Hawaiian Islands by management areas (*Mau* and *Ho'omalu* Zones) for 1993 comparing NMFS data (1993a) and a combination of NMFS and HDAR extrapolated data set (1993b).

	1993a		1993b	
	Mau	*Ho'omalu*	*Mau*	*Ho'omalu*
Vessels (No.)	8	4	8	4
Trips (No.)	56	32	72	34
Trips/vessel (No.)	7	8	9	8
Days at sea	520	662	NA	NA
Days fished	274	364	NA	NA
Days fished/trip	4.9	11.4	NA	NA
Days/trip	9.3	20.7	NA	NA
BMUS/trip (lb)	1,312	8,248	1,323	8,414
Total catch/trip (lb)	1,484	8,417	1,547	8,584
BMUS/fishing day (lb)	267	723	NA	NA
Total catch/fishing day (lb)	302	738	NA	NA
Revenue/trip (US$)	4,667	25,114	4,736	25,553
Revenue/vessel (US$)	32,675	200,918	42,624	217,208

Table 7.--Hawaii's market for bottomfish caught in the Northwestern Hawaiian Islands (NWHI) and the main Hawaiian Islands (MHI), based on market expansion estimates by the National Marine Fisheries Service, 1987-93. Columns may not total because of rounding and landings not enumerated by source.

Source	1987	1988	1989	1990	1991	1992	1993
			Landings (in 1,000 lb)				
Hawaii	1,799	1,791	1,310	1,082	948	1,011	733
NWHI	1,015	625	303	421	387	424	385
MHI	783	1,164	1,006	645	561	587[a]	348[a]
Imports[b]	472	334	564	620	479	634	550
Total bottomfish	2,271	2,125	1,874	1,702	1,427	1,645	1,283
			Revenue (in US$1,000)				
Hawaii	4,644	4,788	3,840	3,335	2,713	3,052	2,312
NWHI	2,300	1,500	756	1,070	1,000	1,210	1,166
MHI	2,344	3,288	3,090	2,265	1,713	1,842[a]	1,146[a]
Imports[b]	1,070	800	1,396	1,567	1,009	1,842	1,666
Total bottomfish	5,714	5,588	5,236	4,911	3,722	4,861	3,928

[a]Preliminary estimate from Hawaii Division of Aquatic Resources data.
[b]Estimated by NMFS.

Table 8.--Species composition of bottomfish landings in the Northwestern Hawaiian Islands, 1987-93 (BMUS = bottomfish management unit species).

Species	Catch (x 1000 pounds)						
	1987	1988	1989	1990	1991[a]	1992[a]	1993[a]
Opakapaka	370	154	112	79	86	145	158
Onaga	77	80	13	21	46	23	40
Ehu	40	45	9	25	20	8	11
Hapuupuu	223	156	66	85	59	57	60
Butaguchi	217	111	57	103	75	79	64
Uku	2	6	5	60	69	86	33
Other BMUS	72	69	39	42	22	22	15
Total BMUS	1001	621	302	413	377	420	381
Other bottomfish	14	5	1	8	10	4	4
Total bottomfish	1015	626	303	421	387	424	385

[a]Combination NMFS-HDAR data set.

Table 9.--Northwestern Hawaiian Islands bottomfish management unit species landings composition by trip, 1991[1], 1992[1], and 1993[1].

Species	1991		1992		1993	
	Mau	*Ho'omalu*	*Mau*	*Ho'omalu*	*Mau*	*Ho'omalu*
Opakapaka	163	1530	448	3208	382	3849
Onaga	83	837	124	450	66	1042
Ehu	176	113	48	148	69	185
Hapuupuu	189	913	121	1386	210	1305
Butaguchi	228	1196	336	1660	415	1004
Uku	266	985	100	2187	112	736
Other BMUS	94	297	56	425	67	291
Total per trip	1200	5873	1273	9464	1321	8412

[1]Data from combination of NMFS and HDAR data sets.

Table 10.--Hawaii's bottomfish prices (US$/lb) by capture location, and Hawaii's bottomfish market prices by species and source, 1990-93 (NWHI = Northwestern Hawaiian Islands, MHI = main Hawaiian Islands).

Species	Market	NWHI	MHI	Market	NWHI	MHI
		1990			**1991**	
Opakapaka	4.81	4.19	5.07	3.89	3.53	4.14
Onaga	5.88	3.82	6.10	5.06	4.47	5.37
Ehu	3.96	2.65	4.73	3.00	2.71	4.13
Hapuupuu	2.83	2.65	3.44	2.72	2.50	3.10
Butaguchi	1.66	1.39	3.38	1.46	1.19	1.93
Other BMUS	2.69	2.57	2.62	2.59	2.50	2.28
Other bottomfish	2.27	1.22	2.48	2.11	1.31	1.87
Imports[b]	2.54			2.58		
Total bottomfish	2.98	2.54	3.74	2.87	2.58	3.35
		1992			**1993**	
Opakapaka	4.08	3.98	4.16	3.97	3.74	4.34
Onaga	5.24	3.87	5.69	4.71	3.27	6.08
Ehu	3.72	2.51	4.07	4.04	3.26	4.56
Hapuupuu	2.74	2.57	3.43	2.82	2.78	3.12
Butaguchi	1.56	1.51	3.32	1.73	1.67	2.93
Other BMUS	2.28[a]	2.67	2.31	2.34[a]	2.64	2.30
Other bottomfish	2.28[a]	1.33	1.77	2.34[a]	1.50	2.12
Imports[b]	2.85			3.03		
Total bottomfish	3.04	2.85	3.40	3.16	3.03	3.54

[a]Combination of other bottomfish management unit species and other bottomfish species.
[b]Estimated as equivalent to the NWHI average price.

Table 11.--Hawaii's commercial bottomfish landings, 1970-93, based on data from the Hawaii Division of Aquatic Resources (1970-78) and NMFS estimates (1979-93).

Year	Landings (x 1000 lb)	Revenue (x $1000)	Inflation-adjusted price US$/lb[a]
1970	344	253	2.85
1971	410	312	2.84
1972	407	366	3.24
1973	454	418	3.18
1974	413	421	3.19
1975	544	577	3.03
1976	558	693	3.38
1977	562	764	3.51
1978	740	1,100	3.58
1979	809	1,296	3.47
1980	856	1,218	2.76
1981	993	1,794	3.17
1982	1,162	2,177	3.10
1983	1,422	3,228	3.65
1984	1,464	3,147	3.35
1985	1,687	3,754	3.27
1986	1,680	3,952	3.39
1987	1,799	4,645	3.54
1988	1,790	4,788	3.46
1989	1,310	3,840	3.65
1990	1,082	3,335	3.60
1991	949	2,713	3.08
1992[b]	1,011	3,052	3.10
1993[b]	734	2,312	3.15

[a]Prices were calculated from landings (pounds caught) rather than pounds sold; prices were adjusted for inflation with 1993 Honolulu consumer price index.

[b]Preliminary figures adjusted by NMFS for incomplete reporting.

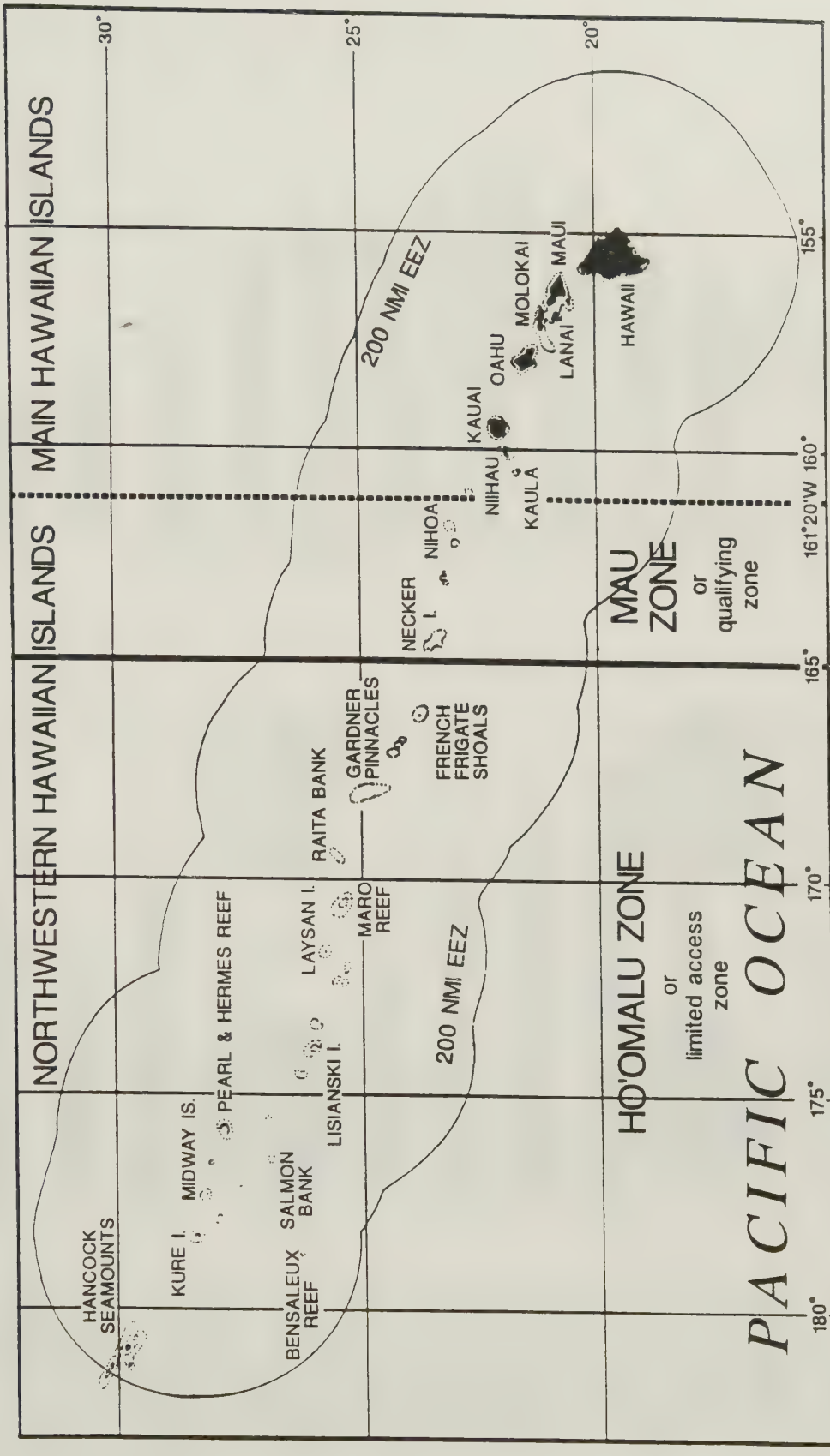


Figure 1.--Map of the Northwestern Hawaiian Islands.

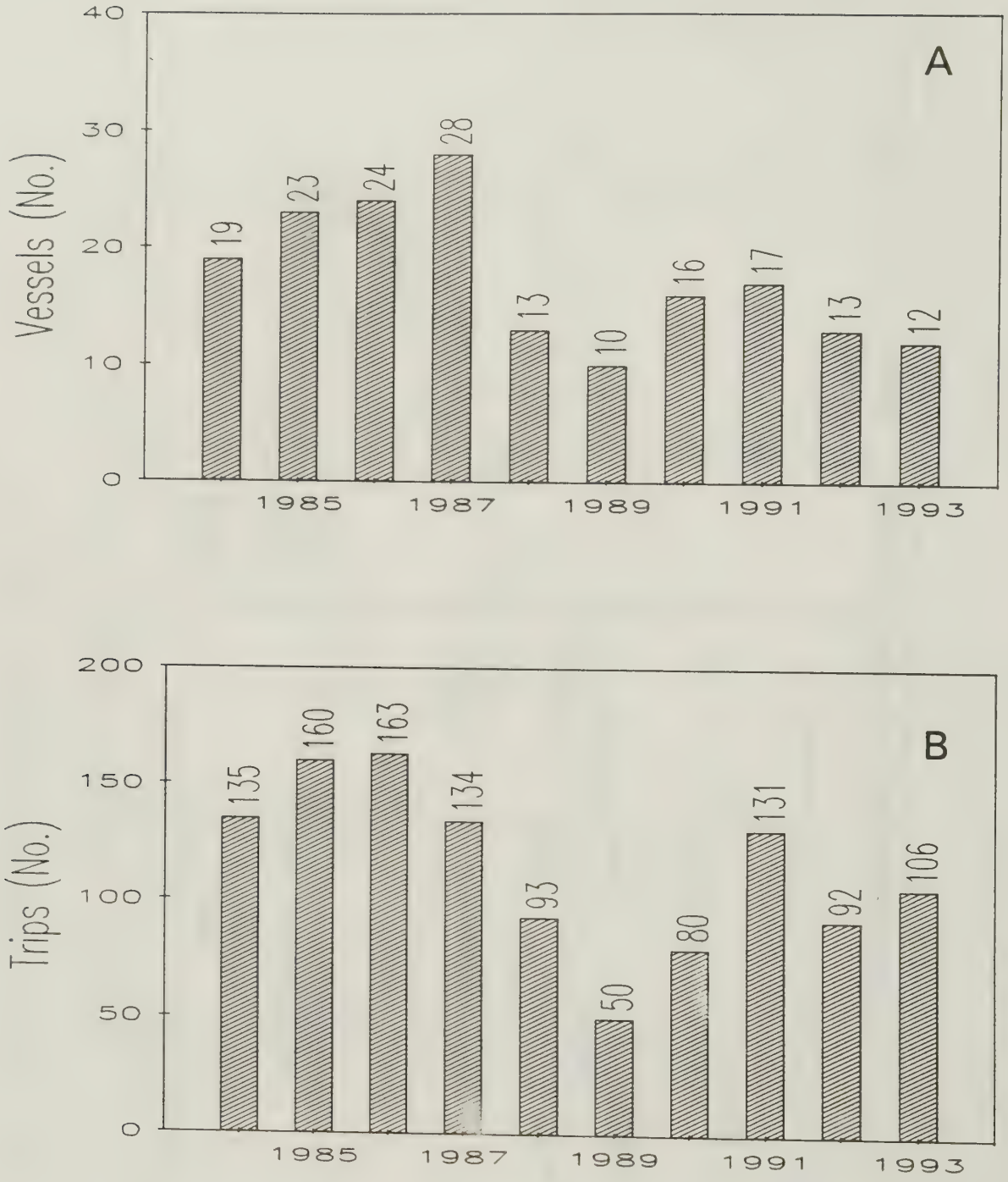


Figure 2.--The bottomfish fleet in the Northwestern Hawaiian Islands, 1984-93: (A) number of vessels and (B) trips. Data for 1984-90 are from the monitoring program of the National Marine Fisheries Service. Data for 1991-1993 are from the combined NMFS-HDAR data set.

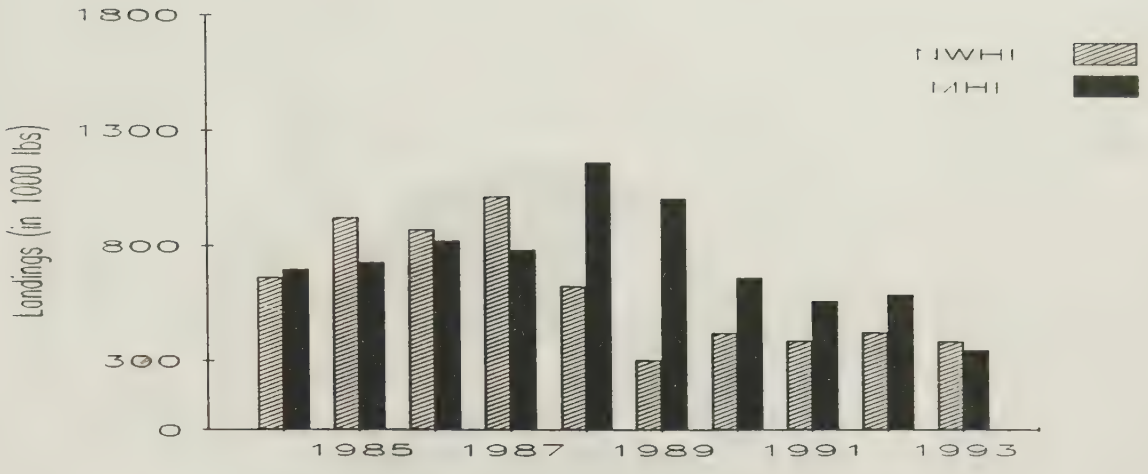


Figure 3.--Hawaii's bottomfish landings, 1984-93, based on estimates made by the National Marine Fisheries Service (NWHI = Northwestern Hawaiian Islands, MHI = Main Hawaiian Islands).

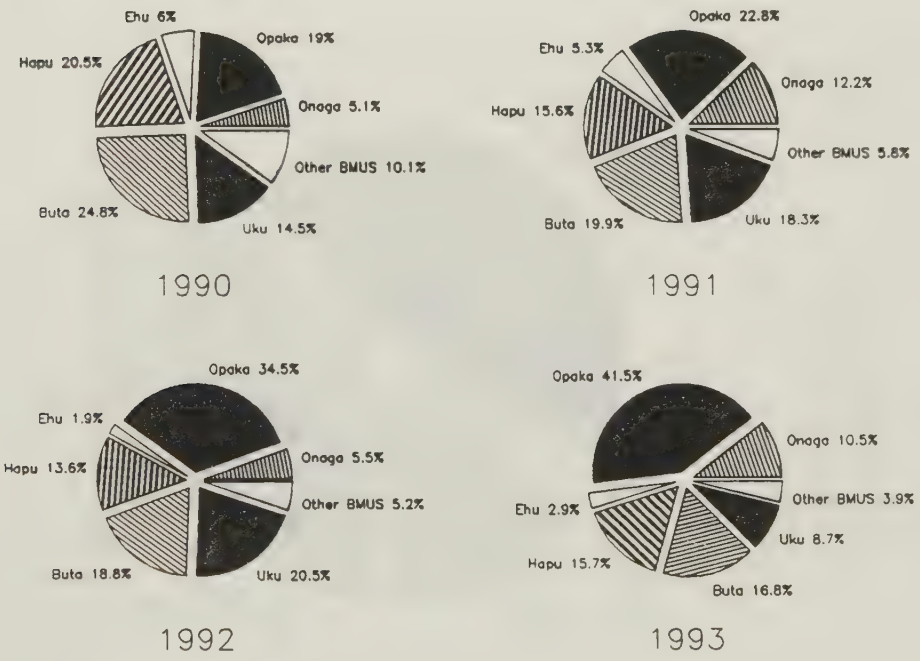
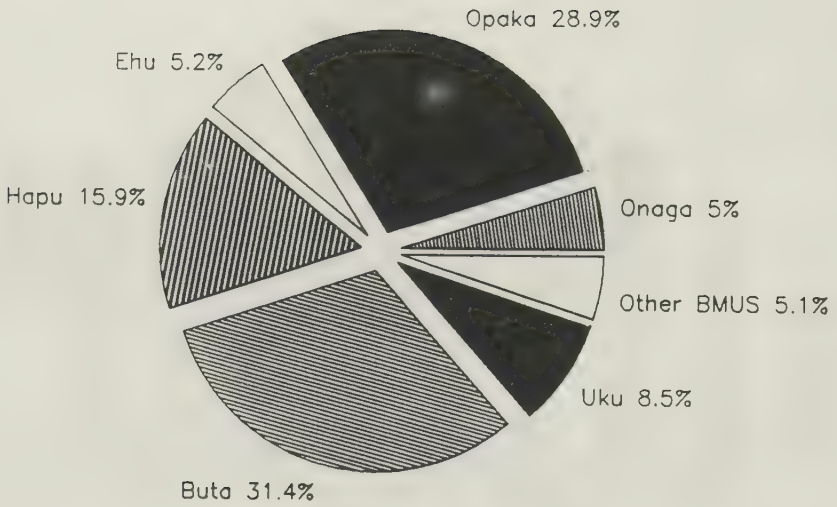


Figure 4.--Composition of landings (by weight) of bottomfish management unit species by the bottomfish fleet in the Northwestern Hawaiian Islands, 1990-93.

A



B

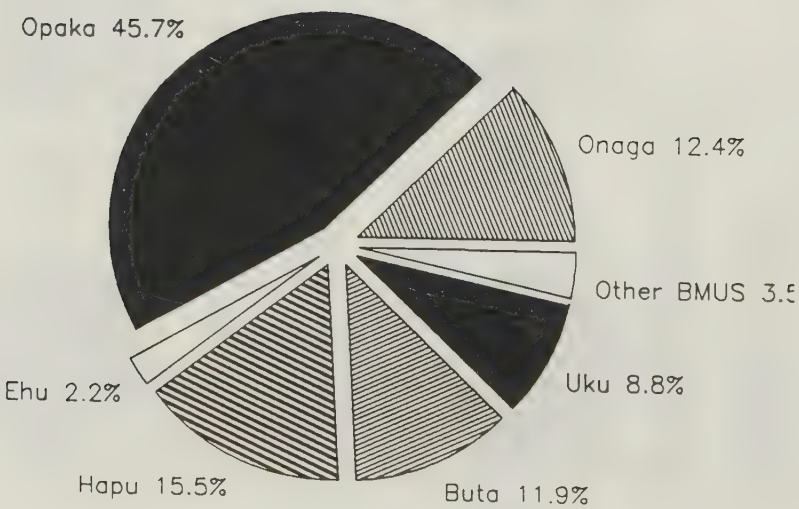


Figure 5.--Species Composition of landings (by weight) of bottomfish and species landed in (A) the *Mau* Zone and (B) the *Ho'omalu* Zone in 1993.

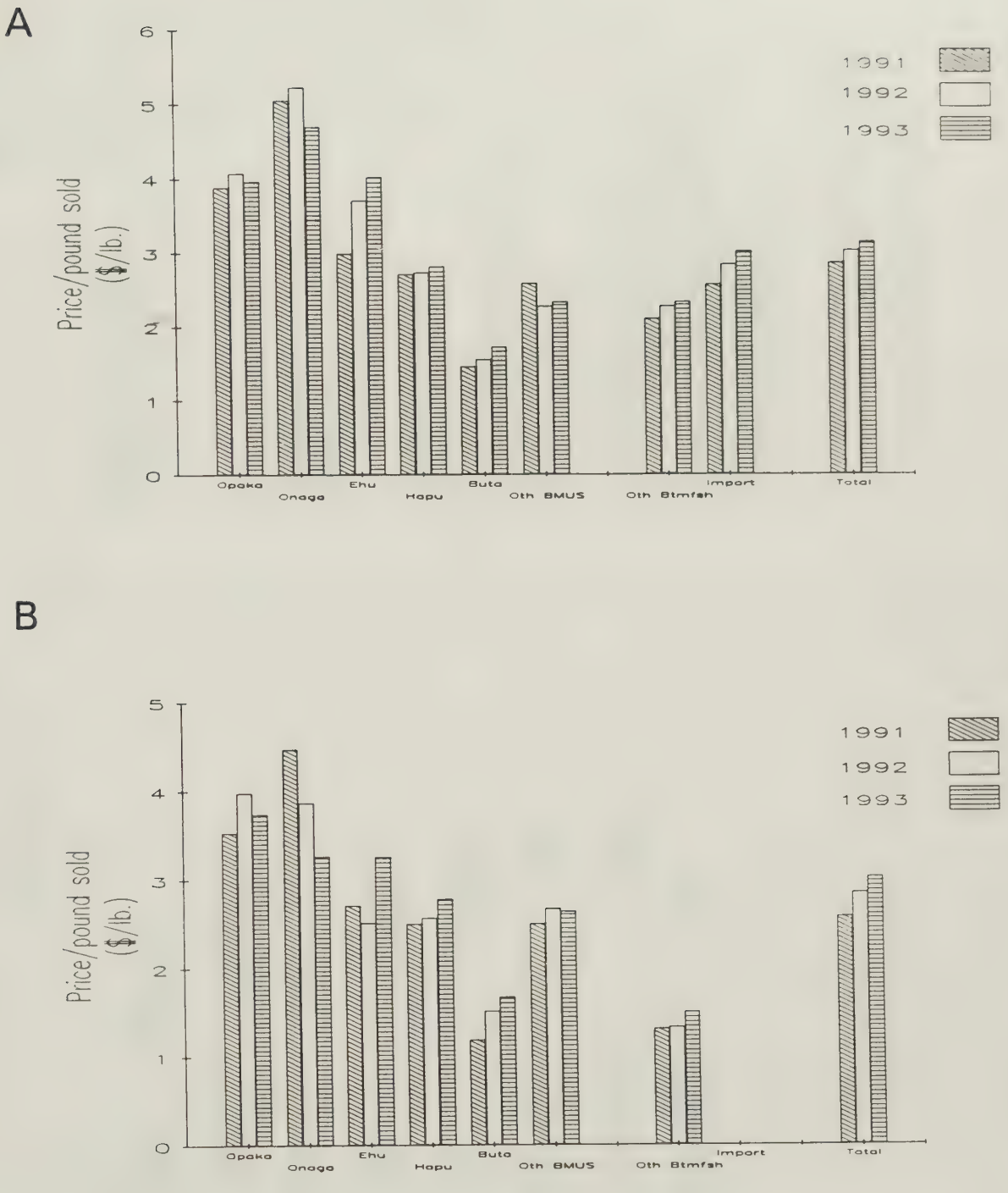


Figure 6.--Hawaii's 1991-93 market prices for bottomfish: (A) NWHI and MHI combined and (B) NWHI.

C

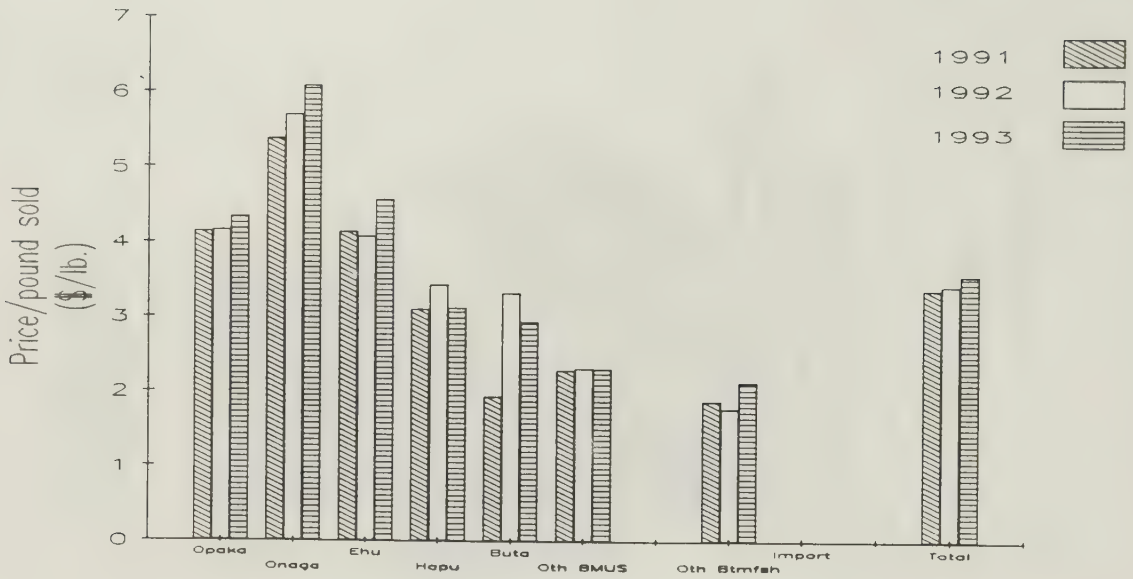


Figure 6.-Continued. (C) MHI.

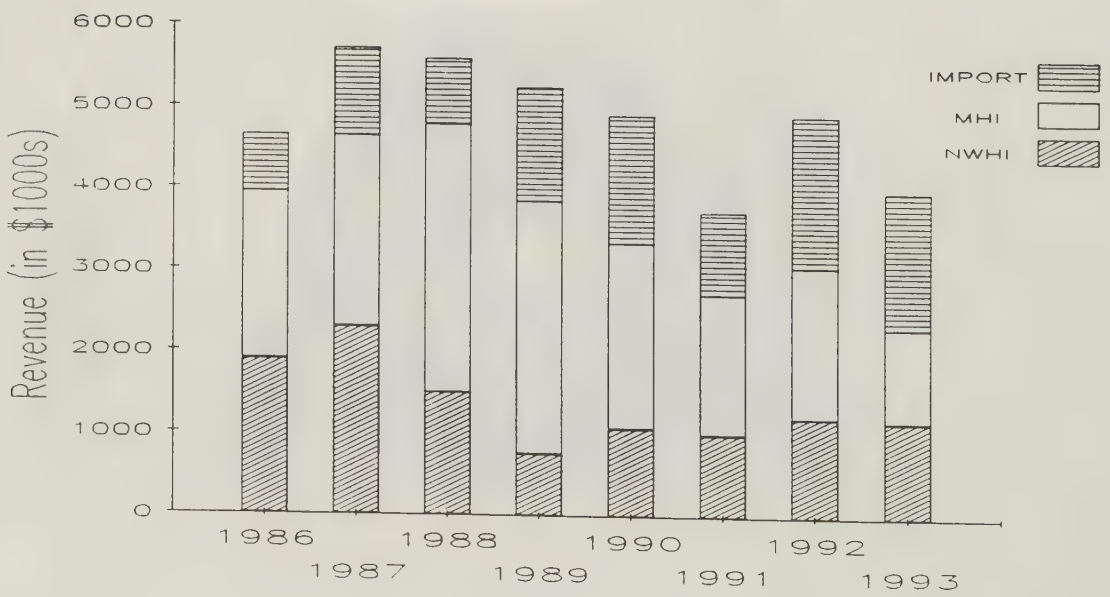


Figure 7.--Hawaii's bottomfish market revenue, 1986-93 (NWHI = Northwestern Hawaiian Islands, MHI = Main Hawaiian Islands). Data from NMFS market monitoring program.

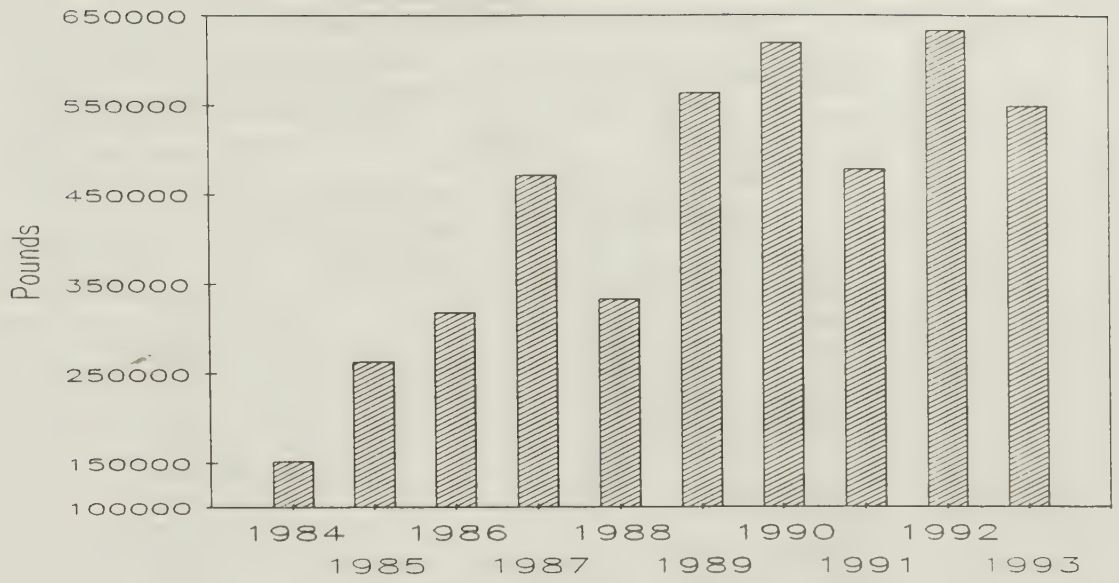
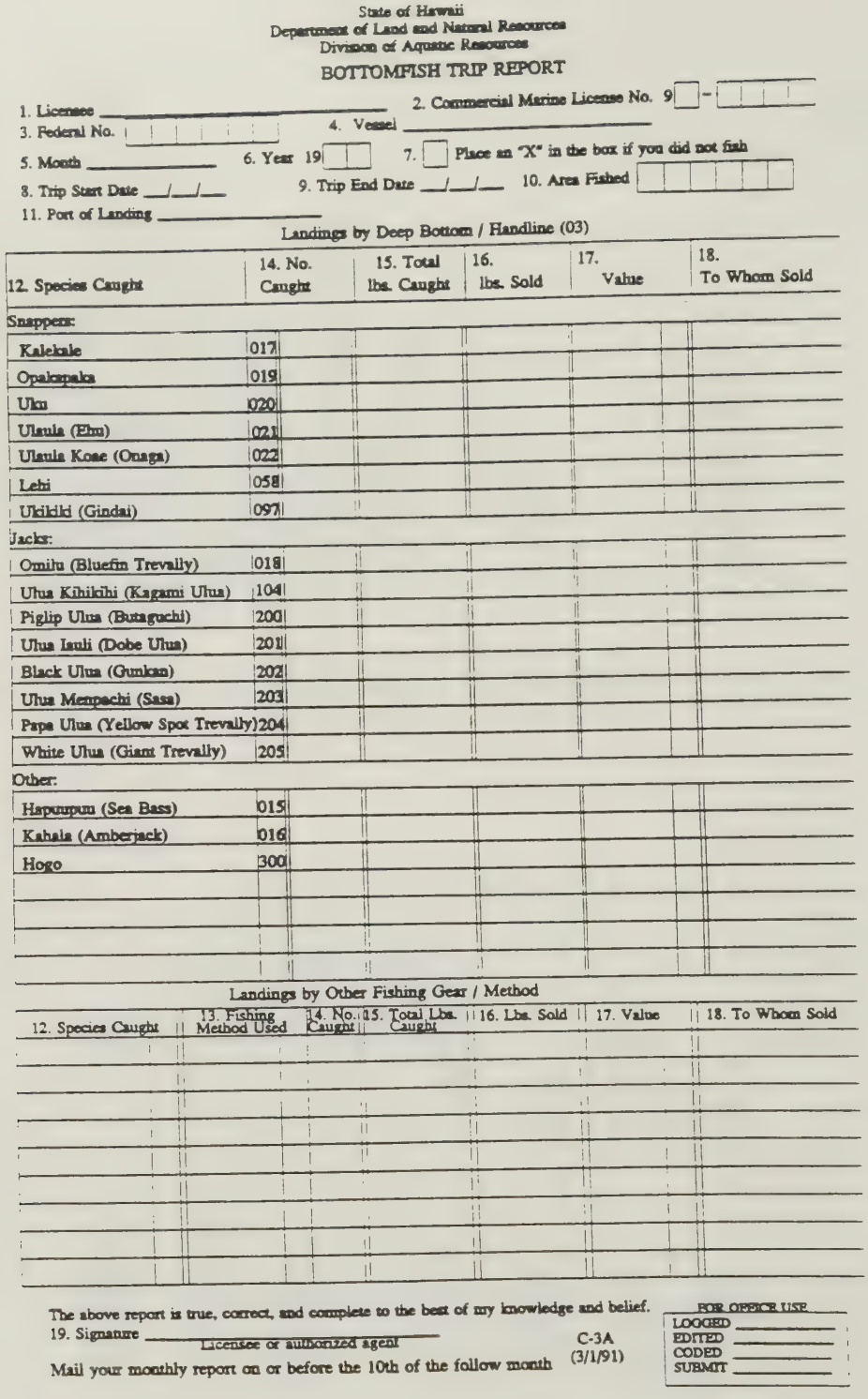


Figure 8.--Bottomfish imports to Hawaii, 1984-93. Data from NMFS Market News.



State of Hawaii
Department of Land and Natural Resources
Division of Aquatic Resources

BOTTOMFISH TRIP REPORT

1. Licensee _____ 2. Commercial Marine License No. 9[ ]-[ ][ ][ ]
3. Federal No. [ ][ ][ ][ ][ ][ ] 4. Vessel _____
5. Month _____ 6. Year 19[ ][ ] 7. [ ] Place an "X" in the box if you did not fish
8. Trip Start Date __/__/__ 9. Trip End Date __/__/__ 10. Area Fished [ ][ ][ ][ ][ ][ ]
11. Port of Landing _____

Landings by Deep Bottom / Handline (03)

12. Species Caught	14. No. Caught	15. Total lbs. Caught	16. lbs. Sold	17. Value	18. To Whom Sold
Snappers:					
Kalekale	017				
Opakapaka	019				
Uku	020				
Ulaula (Ehu)	021				
Ulaula Kose (Onaga)	022				
Lehi	058				
Ukikiki (Gindai)	097				
Jacks:					
Omilu (Bluefin Trevally)	018				
Ulua Kihikihi (Kagami Ulua)	104				
Piglip Ulua (Butaguchi)	200				
Ulua Iauli (Dobe Ulua)	201				
Black Ulua (Gunkan)	202				
Ulua Menpachi (Sasa)	203				
Papa Ulua (Yellow Spot Trevally)	204				
White Ulua (Giant Trevally)	205				
Other:					
Hapuupuu (Sea Bass)	015				
Kahala (Amberjack)	016				
Hogo	300				

Landings by Other Fishing Gear / Method

12. Species Caught	13. Fishing Method Used	14. No. Caught	15. Total Lbs. Caught	16. Lbs. Sold	17. Value	18. To Whom Sold

The above report is true, correct, and complete to the best of my knowledge and belief.
19. Signature _____ Licensee or authorized agent

Mail your monthly report on or before the 10th of the follow month

C-3A (3/1/91)

FOR OFFICE USE
LOGGED _____
EDITED _____
CODED _____
SUBMIT _____

Send This Copy

Figure 9.--State of Hawaii, Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR), Bottomfish Trip Report Form C-3A.

State of Hawaii
Department of Land and Natural Resources
Division of Aquatic Resources

BOTTOMFISH TRIP SALES REPORT

Licensee _____ Commercial Marine License No. [ ][ ][ ][ ]

Federal No. [ ][ ][ ][ ][ ][ ] or HA No. (H)[A] - [ ][ ][ ][ ] - [ ][ ] Vessel _____

Month _____ Year 19[ ][ ]

Trip Start Date ___/___/___ Trip End Date ___/___/___

Port of Landing _____

Landings by Deep Bottom/Handline (03)

Species Caught		Lbs. Sold	Value of lbs. Sold	To Whom Sold
Snappers:				
Ehu	021			
Gindai	097			
Kalekale	017			
Lehi	058			
Onaga	022			
Opakapaka	019			
Uku	020			
Jacks:				
Black Ulua, Gunkan	202			
Butaguchi	200			
Dobe Ulua	201			
Kagami Ulua	104			
Omilu	018			
Papa Ulua	204			
Menpachi Ulua, Sasa	203			
White Ulua	205			
Other:				
Hapuupuu	015			
Hogo	300			
Kahala	016			

Landings by Other Fishing Gear/Method

Species Caught	Fishing Method/Gear	Lbs. Sold	Value of lbs. Sold	To Whom Sold

The above report is true, correct, and complete to the best of my knowledge and belief.

Signature _____
Licensee (or authorized agent)

Mail this report on or before the 10th of the following month.

(1/21/94) Send This Copy

Figure 10.--State of Hawaii, Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR), Bottomfish Trip Sales Report.

DEPARTMENT OF LAND AND NATURAL RESOURCES

FISH CATCH REPORT

DIVISION OF AQUATIC RESOURCES
STATE OF HAWAII

1. Name of Licensee ..... 2. Commercial Marine License No. ..... 9☐-☐☐☐☐

3. Name of Boat ..... 4. HA No. HA-☐☐☐☐-☐☐ 5. Federal No. ☐☐☐☐☐☐

6. Month Fished..... 7. Year Fished — 19☐☐ ☐ Place an "X" in the box if you did not fish

8. Day Fished	9 Area Fished	9a. Buoy Fished	10 Type of Fishing Gear Used	11. Species Caught	12. No. Caught	13. Lbs. Caught	14. Lbs. Sold	15. Value of Lbs. Sold	16. To Whom Sold	17 Port of Landing

ee Instruction on Page 1

C-3 (Rev. 3/1/91)

FOR OFFICE USE

LOGGED
EDITED
CODED
SUBMIT

The above report is true, correct, and complete to the best of m knowledge and belief.

18. Signature .....
Licensee or Authorized Agent

SEND THIS IN

Figure 11.--State of Hawaii, Department of Land and Natural Resources (DLNR), Division of Aquatic Resources (DAR), Fish Catch Report Form C-3.

DAILY BOTTOMFISH CATCH LOG - NORTHWESTERN HAWAIIAN ISLANDS

Vessel_____ Permit No. BFP_____ Date_____

Latitude____° ____" N Longitude____° ____" W Bank _____

Current Speed/Direction____(Knots)/_____ Wind Speed/Direction____/_____

No. of Lines_____ No. of Hooks/Line_____ Wave Height (ft)_____

No. Hours Fished: Day_____ Night_____ Depth Range (fm)_____

Species	Tally Area	No. Kept	No. Damaged/Lost	No. Released
1 Opakapaka				
2 Onaga				
3 Ehu				
4 Uku				
5 Hapuupuu				
6 Butaguchi				
7 White Ulua				
8 Kahala				
9 Others:				

DAILY PROTECTED SPECIES INTERACTION LOG

Species	Sighted in Area of Gear		Released or Lost					
			Alive		Injured		Dead	
	Tally	Total	Tally	Total	Tally	Total	Tally	Total
50 Dolphin								
53 Green Turtle								
58 Other Turtle								
51 Monk Seal								
55 Albatross								
56 Booby								
57 Others (specify)								

Description & Location of Interaction --

Bank _____

I certify that the above information is complete and true to the best of my knowledge.

Captain_____ Date_____

Figure 12.--Proposed Federal Daily Bottomfish Catch Log.